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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MERED, HABTE	

ART UNIT	PAPER NUMBER
2662	

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/892,330	MICHAEL A. O'CONNOR	
	Examiner	Art Unit	
	Habte Mered	2662	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6-9,11,13-15,17,19-22,24 and 26-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6-9,11,13-15,17,19-22,24 and 26-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The amendment filed on 11 April 2005 has been entered and fully considered.

2. Claims 3, 5, 10, 12, 16, 18, 23, and 25 are cancelled by the Applicant.

3. Claims 1, 2, 4, 6-9, 11, 13-15, 17, 19-22, 24, and 26-32 are pending.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims **1, 2, 4, 6-9, 11, 13-15, 17, 19-22, 24, and 26-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Blumenau (U.S. 6,665,714) in view of Blumenau et al. (U.S. 6,260,120), hereinafter referred to as Blumenau& Raz.

Blumenau discloses a data management system that reserves volumes of data in a storage system for host processors based on host identifiers. Blumenau's system has a configuration data that identifies the portions of the storage system that are accessible by the host and stored centrally at the storage system. Pertinent information of each host found in the configuration data is further stored locally in the hosts. Both the host and the storage system have path discovery tools to build their respective topology database.

6. Regarding **amended claims 1, 21, 29, and 32**, Blumenau discloses a method of locating storage to a host in a computer network **(Column 1, Lines 7-9; Column 6, Lines 4-10)**, the method comprising: the host performing path discovery **(Column 3,**

Lines 25-35; Column 6, Lines 62-67; Column 7, Lines 1-12; Every entity including hosts added to Blumeanu's system conduct path discovery); identifying storage coupled to the computer network **(Column 2, Lines 30-50)**; mapping the storage to the host (**Column 6, Lines 45-55)**; building a storage path database **(Column 6, Lines 50-61; Column 9, Lines 14-20 and 35-40;Column 11, Lines 15-20; Column 19, Lines 1-10 and 60-67)**.

Blumenau provides a utility to each host to retrieve pertinent data from the centrally stored configuration database for the purpose of allowing the host to view and manage the host/HBA pair and to configure storage volume assignments. **(Column 21, Lines 45–60; Column 23, Lines 1-5; Step 1380 in Figure 13)**

Blumenau, however, fails to expressly disclose that the storage path database can be stored locally in the host. Blumenau, also fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure and the failure is detected.

*Blumenau & Raz disclose the volume access table (i.e. storage path database) contains the relationship between hosts and respective lists of volumes of storage accessible to the hosts. **(Column 14, Lines 29-31)**. Blumenau & Raz disclose that when the host's state changes (e.g. system boot after host failure), then the host controller port will transmit its state change to the storage system and the storage system will access the volume access table (i.e. storage path database) and reestablish the relationship of the host controller port's volume group name and volume list with respect to its new 64 bit port identifier (WWN) and source id (S_ID).*

Blumenau & Raz disclose that the database is stored within the host.(**Blumenau & Raz disclose that the retrieved volume access table (i.e. storage path database) can be stored locally within the host. See Column 32, Lines 43-45.)** Blumenau & Raz also disclose that a failure of the host is detected. **(See Column 44, Lines 26-30; Blumenau & Raz disclose that the state of login changes of the host is monitored by the storage system. Further Blumenau & Raz teach that their system provides a mechanism for the network to automatically detect certain changes of state, which may indicate that the configuration of the system has changed. Since the hosts are part of the network they must be able to identify and detect minor host failures such as when a mapping between their ports and the storage system changes which certainly will cause change in the system configuration. Column 12, Lines 66-67; and Column 13, Lines 1-12;)** Blumenau & Raz discloses that the stored database is retrieved, in response to detecting the failure and the database is utilized to re-map the storage to the host. **(Column 33, Lines 14-23, 25-41 and 50-63)**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate an option to store the database locally in the host and a method for handling host failures, the motivation being an improved data storage system with fault tolerance and failover capability and also to address the need for a method that is transparent to any high-level storage system procedures that may be used by the hosts for managing access to data stored in the storage system to which a host is only permitted to access.

7. Regarding **claims 2, 9, 15, and 22** Blumenau discloses a method wherein the path discovery comprises: querying a switch coupled to the host; detecting an indication that the storage is coupled to the switch via a first port; and performing a query via the first port. **(Blumenau shows in Figure 1(c) hosts coupled to a storage system using a switch. Blumenau further shows that a storage system with a first port (Port 0) is coupled to a switch fabric network 10. See Column 6, Lines 39-41. Blumenau discloses a path discovery method where each device queries the network that contains a switch as shown in Figure 1(c) to identify the other devices coupled to the network. See Column 6, Lines 62-63. Therefore a path discovery for one of the hosts coupled to the switch 10, in Figure 1c, will involve a query via the first port of the storage system and will indicate hosts 1 and 2 are mapped to the storage system via Port 0 of the storage system.)**

8. Regarding **amended claims 4, 11, 17, and 24,** Blumenau discloses a method, further comprising storing the database on the storage. **(Column 8, Lines 10-14; Column 9, Lines 20-23; See element 32 in Figure 3)**

9. Regarding **amended claims 6, 13, 19, and 26,** Blumenau teaches a method of storage allocation in a system that has a plurality of hosts coupled to a storage system using a switch. Such a system has a storage path database that contains the mapping between a given host and a storage unit and the path between the host and the storage unit. When a new host is mapped to a storage system a query is conducted to determine appropriate path.

Blumenau, however, fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure. Specifically it fails to disclose if any checks are performed on the storage database after the database is retrieved as a result of detecting a host failure. Blumenau fails to disclose the measures to be taken if the check on the storage database indicates an error.

Blumenau & Raz disclose a method, further comprising: performing a check on the database subsequent to the retrieving, wherein the check comprises determining whether the database is valid; and conveying a notification indicating the database is invalid, in response to determining the database is not valid. **(Blumenau & Raz disclose in Figure 17 a flowchart for the storage system port adapter when notified of a network state change such as host controller boot. After the volume access table (i.e. storage path database) is accessed in step 182, a set of checks in steps 183 and 186 are performed to validate the content of the table. In step 187 in Figure 17, if the database has invalid entries then a notification is sent to the System administrator. Blumenau & Raz disclose that each host has the ability to boot from local disk and do volume and topology reconfigurations (i.e. re-map storage to host) and in effect be able to do the steps indicated in Figure 17. See Column 32, Lines 43-45 and Column 33, Lines 13-22.)**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate an option for validating

the storage database during recovery from a host failure, the motivation being preventing database corruption and ensuring system integrity.

10. Regarding **amended claims 7 and 27,** Blumenau teaches a method of storage allocation in a system that has a plurality of hosts coupled to a storage system using a switch. Such a system has a storage path database that contains the mapping between a given host and a storage unit and the path between the host and the storage unit. When a new host is mapped to a storage system a query is conducted to determine appropriate path.

Blumenau, however, fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure. Specifically it fails to disclose if any check should be performed, that involves accessing the storage system, after the database is retrieved as a result of detecting a host failure. Blumenau fails to disclose the measures to be taken if the storage is inaccessible.

Blumenau & Raz disclose a method, further comprising: performing a check on the database subsequent to the retrieving, wherein the check comprises attempting to access the storage; and conveying a notification of a failure to access the storage, in response to detecting the storage is inaccessible. **(Blumenau & Raz disclose that it is possible to back up and restore the host-to-volume connectivity configuration information (i.e. host to storage mapping). See Column 45, Lines 3-5. The flowchart in Figure 17 is one way to accomplish host to storage re-mapping after a host failure. After a host is brought back into service after a failure, like any**

other device being entered in the network, a path discovery process is initiated as explained in the arguments for claim 2. The host as part of the path discovery interrogates the storage system for the 64-bit port identifier (WWN), which constitutes as an attempt to establish communication and access the storage system. See Column 36, Lines 58-60 and Column 33, Lines 24-27. Blumenau & Raz unambiguously disclose that the host is always responsible for establishing communications with the storage system. See Column 45, Lines 10-11. It is inherent in any software-based system, such as Blumenau's & Raz's that any failures in testing a sub-system such as accessing storage will result in an error notification.)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate a method that involves a test procedure to access storage allocated to a host during recovery from a host failure, the motivation being an improved data storage system with fault tolerance and failover capability.

11. Regarding **amended claims 8, 14, 20, 28, 30, and 31**, Blumenau discloses a computer network comprising: a network interconnect, wherein the interconnect includes a switching mechanism; a first storage device coupled to the interconnect; and a first host coupled to the interconnect, wherein the first host is configured to perform path discovery, identify the first storage coupled to the computer network, map the first storage to the host, build a storage path database. **(Blumenau discloses that each host and storage system may include one or more ports for interfacing the host**

or storage system to a corresponding one or more networks. See Column 6, Lines 8-10. Figure 1(c) shows a system where a couple of hosts are coupled to a storage device using a switch. Blumenau also discloses that each device in the network will have knowledge of other devices in the network in terms of their ports after the completion of the path discovery process, which involves querying the switch and devices coupled to the network. See Column 6, lines 62-67 and Column 7, Lines 1-12. A storage path database (i.e. configuration database) is initially built and continuously updated as the configuration of the network changes. See Column 9, Lines 14-21. Blumenau's invention also gives, each host, ability to access the configuration database via a GUI or via a command line interface. See Column 18, Lines 9-24 and Figures 19-22. The allocation mechanism may reside in the host as a software utility. See Column 21, Lines 48-55.)

Blumenau, however, fails to expressly disclose that the storage path database can be stored locally in the host. Blumenau, also fails to expressly disclose the recovery steps required in validating the mapping between a host and a storage unit after the host has experienced a failure and the failure is detected.

Blumenau & Raz disclose that the database is stored within the host. (**Blumenau & Raz disclose that the retrieved volume access table (i.e. storage path database) can be stored locally within the host. See Column 32, Lines 43-45.)** Blumenau & Raz also disclose that a failure of the host is detected **(See Column 44, Lines 26-30; Blumenau & Raz discloses that the state of login changes of the host is**

monitored by the storage system. Further Blumenau & Raz teaches that his system provides a mechanism for the network to automatically detect certain changes state, which may indicate that the configuration of the system has changed. Since the hosts are part of the network they are able to identify and detect minor host failures such as when a mapping between their ports and the storage system changes. Column 12, Lines 66-67; and Column 13, Lines 1-12;) Blumenau & Raz discloses that the stored database is retrieved, in response to detecting the failure and the database is utilized to re-map the storage to the host. **(Column 33, Lines 14-23, 25-41 and 50-63)**

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Blumenau's system to incorporate an option to store the database locally in the host and a method for handling host failures, the motivation being an improved data storage system with fault tolerance and failover capability and also to address the need for a method that is transparent to any high-level storage system procedures that may be used by the hosts for managing access to data stored in the storage system to which a host is only permitted to access.

Response to Arguments

12. Applicant's arguments filed on 11 April 2005 have been fully considered but they are not persuasive.

13. In the Remarks, Page 12, Applicant argues that the limitation "storing said database within the host" is not addressed. Examiner respectfully disagrees with the Applicant's conclusion. Blumenau clearly provides a utility to each host to retrieve

pertinent data from the centrally stored configuration database for the purpose of allowing the host to view and manage the host/HBA pair and to configure storage volume assignments. The data collected by the hosts has to be stored in the hosts, as the hosts will need it in the transaction with the storage system. **(See Blumenau: Column 21, Lines 45–60; Column 23, Lines 1-5; Step 1380 in Figure 13)** Further, Blumenau & Raz shows that the database is stored locally in the host. **(See Blumenau & Raz : Column 32, Lines 43-45).**

14. In the Remarks, Page 12, Applicant argues that the limitation "detecting a failure of said host" is not addressed. Examiner respectfully disagrees with Applicant's conclusion. Blumenau & Raz disclose that the state of login changes of the host is monitored by the storage system. **See Blumenau & Raz: Column 44, Lines 26-30.** Further Blumenau & Raz teach that their system provides a mechanism for the network to automatically detect certain changes of state, which may indicate that the configuration of the system has changed. Since the hosts are part of the network they must be able to identify and detect minor host failures such as when a mapping between their ports and the storage system changes which certainly will cause change in the system configuration. **See Blumenau & Raz: Column 12, Lines 66-67; and Column 13, Lines 1-12**. In both the Applicant's and Blumenau & Raz's system the host failure is detected in terms of the validity of the mapping between the storage system and the host. Blumenau & Raz's system further addresses the recovery step when the host is down and not operational offers its storage database as a "boot disk".

15. In the Remarks, Page 12, Applicant argues that the limitation "retrieving said stored database, in response to detecting said failure; and utilizing said database to re-map said storage to said host" is not addressed. Examiner respectfully disagrees with Applicant's conclusion. **(See Blumenau & Raz: Column 33, Lines 14-23, 25-41 and 50-63).** Blumenau & Raz teach that after detecting a failure in the host in the form of state change and after correcting the problem it may result in topology reconfiguration. **(See Column 13, Lines 1-10.)** Blumenau & Raz teach that in order to re-map the storage to the host as part of a topology reconfiguration, the host reads the primary copy of the storage reconfiguration data, which is equivalent to retrieving the database from the storage system. **(See Column 33, Lines 45-47.)**

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Habte Mered whose telephone number is 571 272 6046. The examiner can normally be reached on Monday to Friday 9:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571 272 3088. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HM
06-27-2005

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